

**MATH
TODAY™**
Teacher Edition

**USA
TODAY**
NO. 1 IN THE USA

×

÷

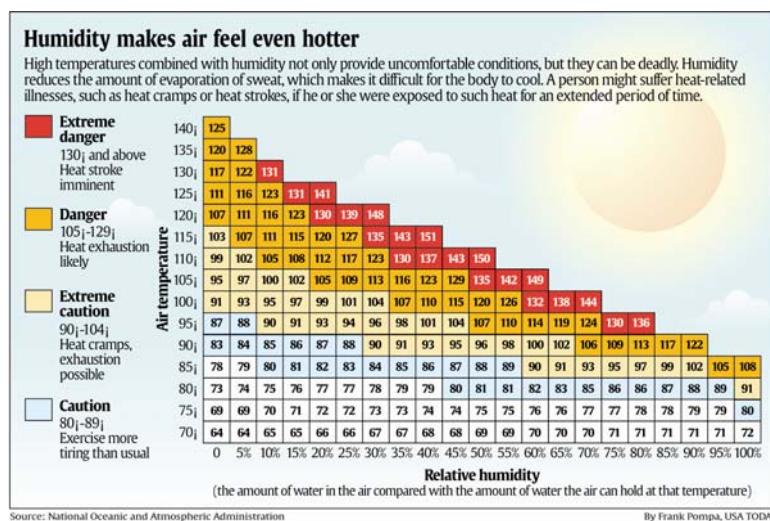
+

-

Activity 6:

Humidity makes air feel even hotter – Part I

by: Bob Tower



Activity Overview:

Using data from the USA TODAY graphic “Humidity makes air feel hotter” students will explore linear and quadratic functions to determine how well they model the relationship between air temperature and heat index. When the models have been determined students will use these models to make predictions about the heat index when given a specific temperature.

Concepts:

- Modeling real-world data with linear and quadratic functions
- Creating scatterplots using real-world data
- Comparing data in graphical and numerical form
- Analyzing rate of change

Activity at a Glance:

- Grade level: 7-10
- Subject: Algebra
*Linear Equations/
Functions*
- Estimated time: four class periods (45 minutes each)

Materials:

- TI-Navigator™ Classroom Learning System
- TI-83 Plus family or TI-84 Plus family

Optional:

- Multimedia Projector
- TI Keyboards

Prerequisites:

Student will know how to:

- build regression models
- create a scatterplot



TI **navigator.**

For use with the TI-Navigator™
Classroom Learning System

**Student Objectives:**

- Explore linear functions that will model the relationship between air temperature and heat index at fixed relative humidity values
- Make generalizations and apply the findings

Background:

Heat index is a measure used to describe the relationship between humidity and temperature and how this makes you feel on a hot day. Mathematical models of the data will be determined and used to predict the temperature when given the heat index and to predict the heat index when given the temperature. This activity will look at the data that will generate a linear graph.

Focus Question:

A linear model, $y = mx + b$

- What is the air temperature at 0% humidity when the heat index is 105°F?

Preparation:

- Setup your TI-Navigator™ 2.0 Classroom Learning System
- Make sure you are familiar with the following functions: Send to Class, Collect from Class, Screen Capture, Quick Poll and Activity Center
- Your students will need a TI-83 Plus or TI-84 Plus graphing calculator, either working in pairs or individually
- Download the activity resource files to your computer from the Activity CD
- Recommendations:
 - Multimedia Projector for sharing the Activity Center, Quick Polls and Screen Captures with your students
 - TI Keyboards for students to easily answer the LearningCheck™ assessment questions

Additional Resources:

See the Preface for classroom management tips and Appendix A for information on TI-Navigator.

Data Source:

- National Oceanic and Atmospheric Administration

Activity Extension:

- This activity is appropriate for pre-algebra
- Research this topic using the National Oceanic and Atmospheric Administration (NOAA) web site - <http://www.noaa.org>
- Find articles in USA TODAY that relate to the effects of a heat wave on people or the economy of a region
- Use TI's data collection technology to test the heat and humidity in your own area

Curriculum Connection:

- Health and Physical Education - explore the effects on the human body during exercise or the effects of extreme heat and humidity on the spread of disease
- Anatomy and Physiology - explore the effects on the human body when these extreme conditions prevail
- Environmental Science - effects of extreme heat and humidity on the environment
- Agricultural Science - Explore the effects of extreme heat and humidity on livestock and crops
- Geography - What regions are experiencing extreme heat and humidity?

**Teacher:****Activity:**

To answer the focus question, students will make a scatterplot for air temperatures from 70°F through 140°F and the corresponding heat index levels at 0% relative humidity

Steps:

1. Send to Class – send humidity data files to class, they will use them to create a scatterplot
2. Screen Capture – check student understanding
3. Quick Poll – Is the association shown by the scatterplot – negative, positive or neither?
4. Quick Poll – True or false, are all of the points in your scatterplot located in the 4th quadrant?
5. Quick Poll – What type of equation do you think would best fit the graph – linear, quadratic or cubic?
6. Calculator – Modeling data with a linear function
7. Screen Capture – check student understanding
8. Activity Center – explore the students regression models
9. Assessment and Evaluation – using LearningCheck™ with Send to/Collect From Class and the Class Results Slide Show

See below for details on each of these steps.

**STEP 1 – SEND TO CLASS**

1. After students have logged into TI-Navigator, send the “Humidity makes air feel hotter” data (MT_L_1_.8xl and MT_L_2_.8xl) to the class using “Force send to students now”
The data represents the air temperatures from 70° F through 140° F and the corresponding heat index levels at 0% relative humidity for Activity 1
2. Prompt the class to create a scatterplot of the data with L1 the independent variable and L2 the dependent variable

Student:**Focus Question:**

What will the air temperature be when the relative humidity is 0% and the heat index is 105°F?

1. Press **[APPS]** and select NavNet, login using your user name and password
2. Wait for the teacher transfer – the data is downloaded in two lists, L1 and L2
3. Once the data is downloaded, press **BACK** (**[ZOOM]**) and then **[4]** to EXIT APP
4. Press **[2nd][Y=]** and adjust the settings for a scatterplot.
5. Press **[WINDOW]** and set the appropriate window values for your data.
6. Press **[GRAPH]**

Teacher:**STEP 2 – SCREEN CAPTURE**

1. Use Screen Capture to check student understanding.
The scatterplots should look like the image on the right. If not, this is an opportunity to discuss appropriate independent and dependent variables for this problem.
2. Instruct your students to return to TI-Navigator when you are ready to continue the activity

**STEP 3 – QUICK POLL**

1. From the pull-down menu select “Multiple Choice A Thru C” and check Resubmit so that students may change their answers
2. Press when you are ready to start
3. Instruct the class to mark and send A, B, or C to answer this question:

Is the association shown by the scatterplot:

- A) negative**
- B) positive**
- C) neither**

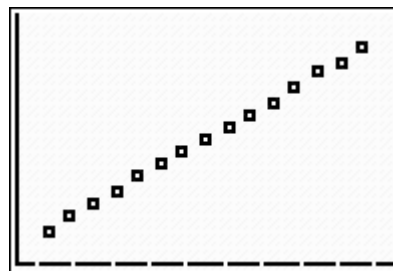
4. Discuss with your class to check for understanding
NOTE: You may select to have a class discussion then select to continue
5. Press when you are ready to continue the activity

**STEP 4 – QUICK POLL**

1. From the pull-down menu select “True False”, make sure the Resubmit option is turned off
2. Press when you are ready to start
3. Instruct you class to mark True or False and send their answer this question:

True or False, are all of the points in your scatterplot located in the 4th quadrant?”

4. Discuss with your class to check for understanding
5. Press when you are ready to move on

Student:

1. Press and select Na v Net
1. Students mark their answer A, B or C and press SEND ()
2. They may resubmit their answers during the class discussion
1. Students mark their answer True or False and press SEND ()

Teacher:**STEP 5 – QUICK POLL**

1. From the pull-down menu select “Multiple Choice A Thru C” and check Resubmit so that students may change their answers
2. Press when you are ready to start
3. Instruct the class to mark and send A, B, or C to answer this question:

Which type of equation (regression model) do you think would best fit the graph? Try the following equations when making your decision.

- A) Linear equation: $y = ax + b$**
B) Quadratic: $y = ax^2 + bx + c$
C) Cubic: $y = ax^3 + bx^2 + cx + d$

4. Discuss with your class to check for understanding
5. Press when you are ready to move on

STEP 6 – MODELING DATA WITH A LINEAR FUNCTION

1. Instruct your students to exit the TI-Navigator Home screen and use the calculator's regression capabilities to create a linear regression based on their scatterplot
2. Once the linear regression is complete, instruct your students to go to the TI-Navigator Home screen

NOTE: *You may want to have your students create the linear regression model right after they create the scatterplot*

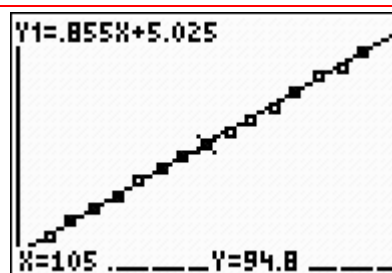
**STEP 7 – SCREEN CAPTURE**

1. Use Screen Capture to check student understanding. *The scatterplots should look like the image on the right. If not, this is an opportunity to discuss appropriate independent and dependent variables for this problem.*
2. Instruct your students to return to TI-Navigator when you are ready to continue the activity

Student:


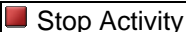
1. Students mark their answer A, B or C and press SEND ()
2. They may resubmit their answers during the class discussion

1. From the TI-Navigator Home screen, press to EXIT APP
2. To use the regression capabilities, press to access the CALC menu
3. Select 4:LinReg(ax+b) and enter
4. Press to have the calculator determine the linear function that best models the data set








1. Press and select NavNet

Teacher:**STEP 8 – ACTIVITY CENTER**





1. In Activity Center, Load Activity Settings – MT_Humidity_Activity_1.act
2. Press  to begin
3. Instruct your students to create two functions that have the same y-intercept as their regression models
4. Watch the solutions and select student expressions that are particularly interesting or ambitious, for discussion
5. If there are submissions that have common errors, you may pause the activity, and discuss “what a student who submitted these equations might have been thinking”
6. Discuss with your class to check for understanding
7. Press  when you are ready to continue


STEP 9 – ASSESSMENT AND EVALUATION

Access your students' understanding by using Send to Class, LearningCheck™ and Class Analysis

1. Using  Send to Class, distribute the LearningCheck assessment file (MT_Humidity_1.edc) to your students using “Force send to students now”
2. Prompt them to open the  LearningCheck assignment and answer the following questions:
Which model did you choose to best represent the data?
 A: A linear model: $y = ax + b$
What will the air temperature be when the relative humidity is 0% and the heat index is 105°F?
 A: 116.9°F
3. Select  Class Analysis
4. Select  Collect Answers Files From Class
NOTE: Before collecting the answers, we recommend that you check the options “Delete Answer File from Device after Collect” and “Delete Assignment File from Device after Collect”
5. Using  Class Results Slide Show, discuss the results with your class to check for understanding

Student:

1. Press  and select NavNet
2. From the TI-Navigator Home screen press  Activity Center
3. When prompted, enter your two equation in Y1= and Y2= and press SEND ()
 OPTION: Press PLOT () to view the graph of your equations before sending

1. From the TI-Navigator Home screen press  Network Apps
2. Select LearnChk
3. Select the MT Humidity 1 assignment and follow the prompts to answer the question (TI Keyboards may be used)